FLOODING ALONG THE VALLEY RIVER

NEAR GRANDVIEW – NE¼ 14-25-24W

January 1985

Manitoba
Water
Commission

Telephone: 924-6482/83

THE MANITOBA WATER COMMISSION
847 — 405 Broadway Avenue
WINNIPEG, MANITOBA
R3C 3L8

The Honourable Mackling
Minister
Department of Natural Resources
Room 215 Legislative Building
Winnipeg, Manitoba
R3C 0V8

Dear Mr. Mackling:

The Manitoba Water Commission has the pleasure to present a report on the "Flooding Along the Valley River Near Grandview - NE¼ 14-25-24W1".

In the preparation of this report the Commission reviewed previous reports, discussed the obstruction in the river channel, and sought technical advice from various sources familiar with the problem of flooding along the Valley River.

The Commission respectfully submits that the conclusions reached in this report will aid the government in any action that may be taken in the formulation of policy with respect to the flooding of the Valley River.

Yours respectfully

D. A. Duncan
D.A. Duncan
Chairman

T.F. Ball

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SYNOPSIS

Flooding of agricultural land along the Valley River upstream from the Town of Grandview has been a recurring problem for many years.

This study addressed this problem from the standpoint of reviewing previous studies and has assessed input from the Water Resources Branch, independent engineers, local farmers, and other individuals in the Grandview area.

The Manitoba Water Commission has concluded that any constrictions to the flow of water in the Valley River have a minimal backwater effect and are not considered to be the cause of crop losses in the region upstream from the Town of Grandview. However, the Commission is of the opinion that the increase in drainage networks has altered the nature of flooding in the lower reaches of the flood plain.

VALLEY RIVER

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I. INTRODUCTION

Flooding of agricultural land along the Valley River upstream from the Town of Grandview with resultant crop loss, has been a recurring problem for many years. Some landowners in the area contend that the man made obstructions in the river channel between P.T.H. #5 and P.R. #366 bridge, namely, the old C.N.R. Crossing, the remains of the old Burrows Stoplog Dam, a temporary crossing constructed by the Town of Grandview and Department of Highways' rock weir at P.R. #366, have resulted in prolonged flooding of their land upstream. (Figure 1).

Although numerous investigations and hydraulic studies have concluded that these obstructions have a negligible effect on the river stage upstream from P.T.H. #5 and there is no economic justification for their removal, several local farmers are reluctant to accept these results and continue to press for their removal.

Because these affected landowners continue to relate their economic difficulties associated with flooding of the Valley River to the so-called obstructions, the Minister of Natural Resources, under Terms of Reference dated July 14, 1983 directed the Manitoba Water Commission to:

1) Determine the effects of the previously mentioned obstructions.
2) Examine the compatibility of existing land use in the immediate vicinity of N.E. Section 14-25-24W with historic and expected flood threats.
3) Determine whether or not the previously mentioned obstructions are necessary to satisfy existing and anticipated needs in the vicinity.

4) Submit a final report to the Minister as soon as it is practicable to do so.

In accordance with the said Terms of Reference, the members of the Manitoba Water Commission reviewed previous hydraulic studies, attended at Grandview to personally view the so-called man made obstructions, consulted with Water Resources Branch personnel, independent engineers, local farmers and other individuals in the Grandview area, and requested an independent assessment of the effects of the so-called obstructions from a hydraulics engineer.

It should be noted that although the Terms of Reference made no mention of the Town of Grandview Water Supply Dam, this obstruction was referred to as the source of the flooding problem by some of the local farmers, and also was an issue raised by G.D. Duncan & Associates, Consulting Engineers, representing one of the local farmers. The members of the Manitoba Water Commission therefore undertook to review the previous studies relating to the Grandview Dam and to assess the backwater effect created by the said Dam.

II. PHYSICAL FEATURES AND HYDROLOGY

The Valley River, which originates in the Duck and Riding Mountains, has an over-all gradient of 0.4 percent, however the slope of the terrain in the upper reaches is approximately 75 to 100 feet per mile, (14-19 m per km) whereas in the vicinity of the Town of Grandview, the terrain is considerably flatter with slopes of approximately 5 to 10 feet per mile (.94-1.9 m per km). The Valley River is a low flow stream with a low sediment transport capacity relative to other streams in the Dauphin

Lake watershed. It is a meandering channel formed through the natural process of erosion, deposition and shifting.

Much of the land which borders the Valley River in the vicinity of the Town of Grandview is in a flood plain and therefore subject to periodic flooding, generally due to snowmelt or heavy rainfall. That flooding along the Valley River has been a perennial problem is documented in a local newspaper item published in 1972 which read: "50 year ago - May 1922 - with the Valley River on its annual spring rampage, bridges and culverts had suffered. The town water system has been out of business, as the pump house being inundated so that machinery could not be operated".*

Water surveys of Canada has since 1956 recorded the flow data on the Valley River approximately one quarter of a mile east of the Town of Grandview, gauging station No. 05LJ021.

The mean flood, defined as the average of the maximum annual daily flows for the period 1956 to 1971 was 879 cfs (24.9 m^3/s) and for the period 1956 to 1981 was 1073 cfs (30.4 m^3/s). The recorded maximum daily flow of 3111 cfs (88.1 m^3/s) occurred on April 20, 1974. The 1967 flood flow of 1331 cfs (37.7 m^3/s) has been equalled or exceeded 12 times in the past 25 years (1956-1983). In other words, this area sustains flooding, on the average, once every two years (See Table 1, p. 4). "Flooding of land bordering the river channel on Sec. 14-25-24W commences when the discharge exceeds 750 cfs . . ."** which is less than the mean flood.

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* Grandview Exponent - May, 1972

** Bodnaruk, B.M., P. Eng., Department of Mines, Resources and Environmental Management, Effects of the Water Supply Dam at Grandview on Flooding Along the Valley River in Sec. 14-25-24W during 1967, October, 1972.

Table 1

Valley River Near Grandview - Station No. 05LJ021 Extreme of Discharge and Total Discharge for Mar. to Oct. for the Period of Record

Year	Maximum Daily Discharge cfs	Maximum Daily Discharge (m^3/s)	Total Discharge (Dam^3)	Year
1956	1631.5	46.2 on May 5	---	1956
1958	221.1	6.26 B on Apr 4	12 400	1958
1959	392.0	11.1 on Jun 17	32 200	1959
1960	1398.5	39.6 on Apr 12	75 500	1960
1961	53.3	1.51 on Jul 18	4 740	1961
1963			---	1963
1964	111.9	3.17 B on Apr 16	8 970	1964
1965	519.1	14.7 on Apr 14	25 200	1965
1966	833.4	23.6 on Apr 5	58 500	1966
1967	1331.4	37.7 on Apr 27	38 800	1967
1968	193.9	5.49 B on Mar 27	12 400	1968
1969	1649.2	46.7 B on Apr 13	28 700	1969
1970	1709.2	48.4 B on Apr 25	93 800	1970
1971	2041.2	57.8 on Apr 10	54 500	1971
1972	1338.4	37.9 on Apr 17	58 600	1972
1973	206.9	5.86 on Aug 28	17 200	1973
1974	3111.2	88.1 on Apr 20	129 000	1974
1975	1779.9	50.4 on Apr 21	115 000	1975
1976	1349.0	38.2 B on Apr 6	117 000	1976
1977	104.9	2.97 on Oct 13	17 300	1977
1978	713.4	20.2 B on Apr 18	31 300	1978
1979	3026.5	85.7 B on Apr 22	105 000	1979
1980	529.7	15.0 B on Apr 8	19 500	1980
1981	1236.0	35.0 on Jul 2	15 300	1981
1982	269.1	7.62 B on Apr 16	12 300	1982
1983	2804.0	79.4 on Apr 24	74 700	1983

B - Ice Conditions

1979 - 89.1 B at 05:21 CST on April 22
1981 - 58.9 at 12:49 CST on July 2

Source: Inland Water Directorate, Water Resources Branch, Water Survey of Canada, Ottawa, Canada 1984
- Surface Water Data, Manitoba, 1983

The results of a flood frequency analysis determined from the records of water surveys of Canada guage station #05LJ021 on the Valley River near Grandview for the period 1956-1981 only, are shown in the following table.

Table 2*

Flood Frequency
Valley River Near Grandview

Frequency	Flood Peak Discharge in cfs	
	cfs	m^3/s**
1 in 2 years	1050	(29.7)
1 in 5 years	1800	(51.0)
1 in 10 years	2400	(68.0)
1 in 20 years	3000	(85.0)
1 in 50 years	3800	(107.0)
1 in 100 years	4600	(130.3)

*Korbaylo - B.W., P. Eng., Manitoba Hydro, "Flooding of the Valley River in the Vicinity of the Town of Grandview at NE Sec. 14-25-24W", January, 1984

**Metric Conversion Added.

An inspection of topography in this area and particularly the NE¼ of 14-25-24W, has indicated that a substantial portion of this land lies below elevation 1404' (427.9 m) a.s.l. and is subject to flooding when flows exceed 750 cfs (21.2 m^3/s). On April 27, 1967, for example, at gauge station No. 05LJ021 - when the flow discharge was 1331 cfs (37.7 m^3/s) the "corresponding stage was 1402.6' (427.5 m) a.s.l. By May 19, 1967, the discharge had decreased to 80 cfs (2.3 m^3/s) with a recorded stage of 1399.1 feet"* (426.4 m) a.s.l.

III. LAND USE CHANGES SINCE 1948 IN THE VALLEY RIVER WATERSHED

Studies have disclosed that there have been dramatic changes in the land use in the Valley River Watershed since 1948. The watershed covers an area of approximately 689.5 $miles^2$ (1786 km^2). In 1948, 37 percent of this area was cultivated land whereas by 1980 the cultivated area increased to 60.4 percent. Most of this increase was at the expense of the woodlands which decreased from 37.3 percent in 1948 to 20.8 percent in 1980. The wetland area also decreased from 3.7 percent in 1948 to 1.2 percent in 1980. Pasture and graze land also declined from 21.9 percent in 1948 to 17.6 percent in 1980.** The hydraulic regime of the Valley River has been profoundly affected by the changes in land use in the area. It is

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*Bodnaruk, B.M., P. Eng., Department of Mines, Resources and Environmental Management, Effects of the Water Supply Dam at Grandview on Flooding Along the Valley River in Sec. 14-25-24W during 1967, October 1972.

**H. Pokrant, M. Gaboury, Remote Sensing to Assess Land Use/Land Cover Changes Affecting The Dauphin Lake Fishery, December, 1983.

believed that land clearing and drainage of wetlands has resulted in increased peak discharges of spring flows. An analysis of the water flows indicates that the current average spring peak discharge in the Valley River has almost doubled compared to the discharges recorded between 1913 - 1928. Wooded lands retain snow for longer periods in the spring thus lengthening the snow melt period and reducing peak flow volumes. Wetlands and swamps also act as water storage reservoirs. However with the reduction in the woodlands and wetlands area, larger volumes of water from rapid spring melt drain into the Valley River with resultant increases in stream discharges.*

It is noted that land owners are continuing to clear lands close to the edges of the river as well as the small bluffs and unproductive pot holes in order to increase their cultivated acreages and, hopefully, production of grain. This has also, however, increased their flooding problems.

"The Valley River has higher peak flows now, with probably more stream bank erosion, but its sediment load per unit of watershed area is the least of all the Dauphin Lake tributaries.(Penner 1982)".*

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*H. Pokrant, M. Gaboury, Remote Sensing to Assess Land Use/Land Cover Changes Affecting The Dauphin Lake Fishery, December, 1983.

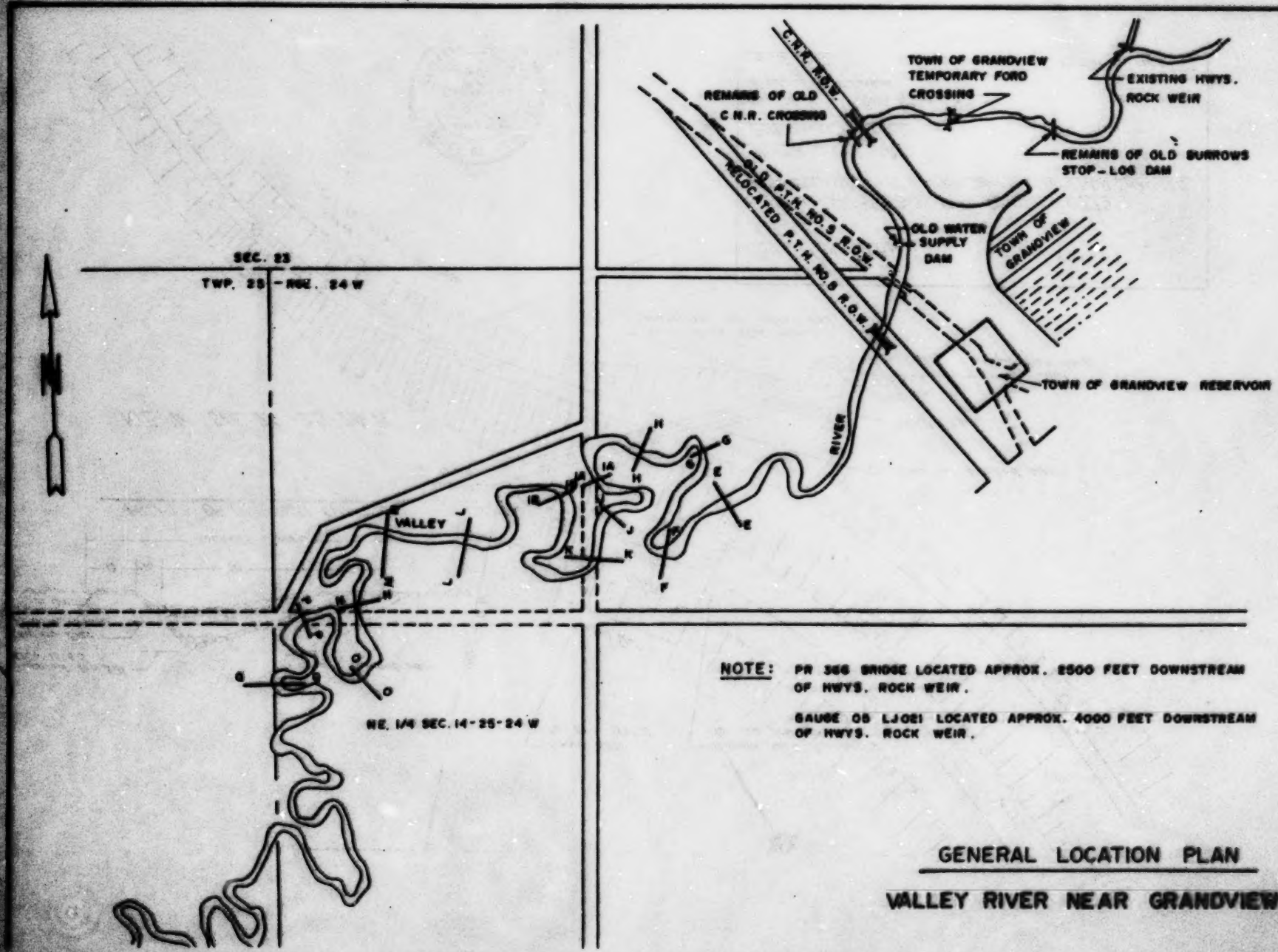
Land in the immediate vicinity of the NE 14-25-24W along the Valley River is in a flood plain, and has a history of frequent flooding as expressed in the Grandview Exponent newspaper article referred to earlier, and confirmed by recorded data since 1956 which indicates that the area is susceptible to flooding once every two years, on the average. It should therefore be expected, in view of the historic record, that flooding in this area will continue.

IV. BACKGROUND

1. Department of Highways' Rock Weir

In order to straighten out P.R. #366 and at the same time avoid having to build two extra bridges, the Valley River adjacent to P.R. #366 was diverted in 1962 by the Department of Highways. To accomplish this diversion and, at the same time, maintain riparian rights and provide a non-stagnant flow of water through the abandoned loop portion of the natural channel, a rock weir was built. (Figures 2 & 3). This control structure was built on the upstream end of the diversion two feet (0.61 m) above the stream bed - i.e., approximately 1393' (424.6 m) a.s.l. - (stream bed 1391' (424 m)). Two 36" x 162' (.91 x 49.4 m) pipes were installed through the dike upstream of this rock weir to ensure riparian flow through the old meander loop.

In 1975 the quality of the water flow in the abandoned loop portion of the Valley River had deteriorated and it was necessary to restore an adequate flow of clear cool water through the loop. Late in the summer

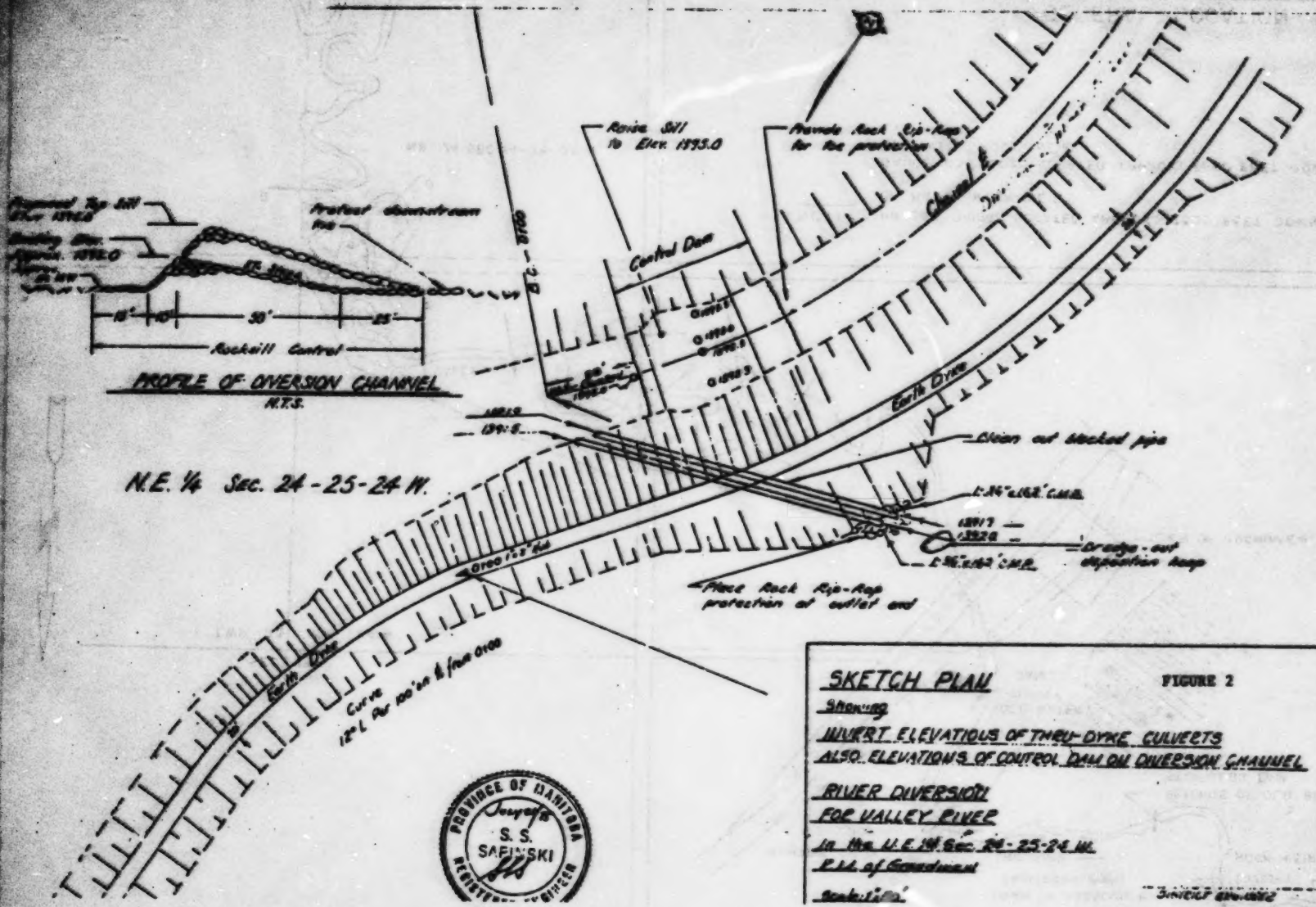


NOTE: PR 366 BRIDGE LOCATED APPROX. 2500 FEET DOWNSTREAM OF HWYS. ROCK WEIR.

GAUGE 05 LJ021 LOCATED APPROX. 4000 FEET DOWNSTREAM OF HWYS. ROCK WEIR.

GENERAL LOCATION PLAN

VALLEY RIVER NEAR GRANDVIEW


Rock fill to Elev. 1995.0
Provide Rock Rip-Rap for fire protection
Channel
Control Dam
Earth Dyke
Clean out blocked pipe
Drainage - out deposition heap
Place Rock Rip-Rap protection at outlet end
Curve 12°L Rad 100'on ℄ from 0+00
PROFILE OF DIVERSION CHANNEL
N.T.S.
Rockfill Control
N.E. ¼ Sec. 24 - 25 - 24 W.

PROVINCE OF MANITOBA
Joseph
S. S.
SAFINSKI
REGISTERED ENGINEER

SKETCH PLAN FIGURE 2

Showing

INVERT ELEVATIONS OF THEW-DYKE CULVERTS

ALSO ELEVATIONS OF CONTROL DAM ON DIVERSION CHANNEL

RIVER DIVERSION

FOR VALLEY RIVER

In the N.E. ¼ Sec. 24-25-24 W.

P.I.L. of Government

Steinbach

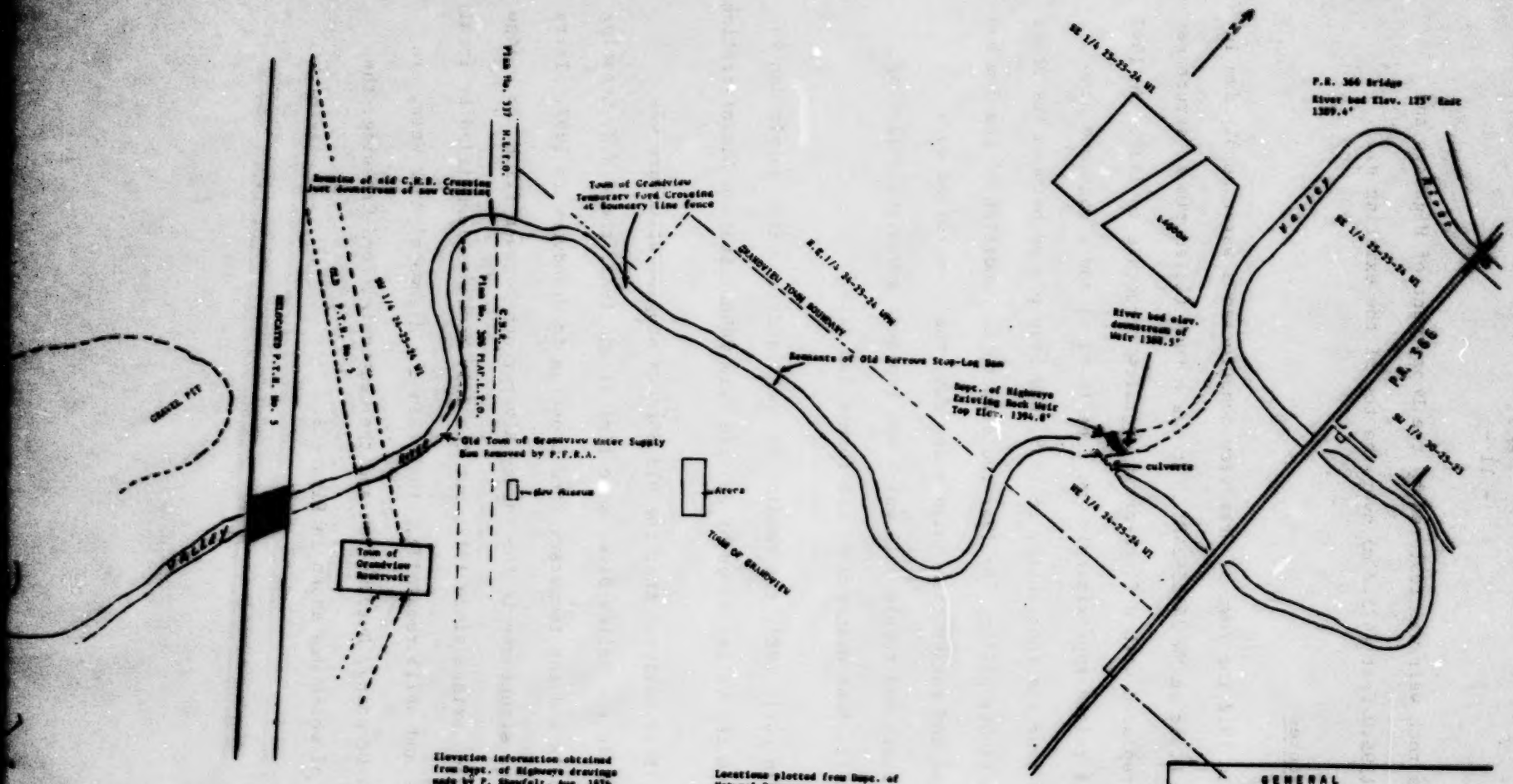
of 1975 the rock weir was restored by the Department of Highways and raised to 1395.0 feet (425.2 m) over the top of the existing sill.

2. Other Structures

In 1912 the Town of Grandview constructed a water supply dam in the Valley River on NW 24-25-24W1. It was a rock filled timber structure which was replaced with a fixed-crest overflow structure in 1939. In 1947 the dam was raised approximately two feet (0.61 m) and a concrete slab was poured over the rock which, in 1939, had been placed between the sheet piling and timber piling. By 1962 the structural condition of the dam had deteriorated and rather than build a new dam, the town relied on a temporary earth and rubble fill which was replaced annually, following spring runoff, just upstream of the former dam site.

In early 1983, the remains of the Grandview water supply dam was removed from the Valley River by Prairie Farm Rehabilitation Administration.

It is believed that the old Burrows stoplog structure was constructed in the Valley River some time around 1912, the C.N.R. Crossing in the 1930's and the temporary Ford Crossing in Grandview in 1967. There were various structures in the Valley River reach between P.T.H. #5 bridge and P.R. #366 bridge since 1912, but the only remnants identified by local landowners and still remaining, other than the Highways' Rock Weir, are the C.N.R. Crossing, Burrows Dam and the Centennial Ford Crossing, the locations of which are shown in Figure 3.


Plan No. 337 R.R.L.P.O.
Location of old C.N.R. Crossing just downstream of new Crossing
Town of Grandview Temporary Ford Crossing at Boundary Line fence
GRANDVIEW TOWN BOUNDARY
N.E.1/4 24-23-24 WPM
Remnants of Old Borrows Stop-Log Dam
Dept. of Highways Existing Rock Weir Top Elev. 1394.8'
River bed elev. downstream of Weir 1388.5'
P.R. 366 Bridge
River bed Elev. 125° East 1389.4'
Ladder
culverts
P.R. 366
Valley River
W 1/2 25-23-24 WI
W 1/2 24-23-24 WI
W 1/2 36-23-23
Plan No. 305 PLAT-L.P.O.
C.N.R.
OLD P.T.R. No. 5
RELOCATED P.T.R. No. 5
GRAVEL PIT
Old Town of Grandview Water Supply Dam Removed by P.F.R.A.
Shed
Town of Grandview Reservoir
Valley River
TOWN OF GRANDVIEW

Elevation information obtained from Dept. of Highways drawings made by P. Shawfelt, Aug. 1976

Locations plotted from Dept. of Natural Resources map.

GENERAL
PLAN OF VALLEY RIVER
NEAR GRANDVIEW

NOT DRAWN TO SCALE

Figure 3 (MHC 1984)

V. PREVIOUS HYDRAULIC STUDIES

Over the past fifteen years, several hydraulic studies have been carried out to ascertain the effect of man-made obstructions in the Valley River in the vicinity of the Town of Grandview.

In October 1972, Mr. B.M. Bodnaruk, P. Eng., at that time an employee with the Water Resources Branch of the Manitoba Department of Mines, Resources and Environmental Management, prepared a report entitled "The Effects of the Water Supply Dam at Grandview on Flooding Along the Valley River in Sec. 14-25-24W During 1967." This study was undertaken to determine the possible effects this dam may have had on flooding conditions upstream in 1967.

The report concluded that for the 1967 peak discharge of 1330 cfs (37.7 m^3/s) the computed backwater effect at the supply dam was 5.2 feet (1.58 m), and at section 14-25-24W the backwater effect caused by the dam was computed at less than 0.1 feet (1.2" or 3 cm). It also concluded that flooding of lands bordering the river channel in section 14-25-24W commences when discharges exceed 750 cfs (21.2 m^3/s) which is less than the mean flood of 879 cfs (24.9 m^3/s).*

It should be noted that the Grandview Supply Dam was viewed by some residents upstream of the dam as being the cause of prolonged flooding of the lands along the Valley River, particularly on section 14-25-24W, and was the subject of litigation in the late sixties and early 1970's. This dam was removed early in 1983 before the spring runoff. In the spring of 1983 the Valley River again flooded section 14-25-24W.

* (Period - 1956-71)

In 1976 the Department of Highways undertook a study to assess the upstream backwater effects, if any, created by the Rock Weir structure on the Valley River at P.R. #366.

This study by S. Sapinski, P. Eng., concluded that "The Rock Weir does exercise 'control' of upstream water levels for the reach between the Weir and the Grandview Dam during periods of low flows. Water levels upstream of the Rock Weir are raised slightly, however they become insignificant and negligible at a distance of 2427' (739.8 m) or say ½ mile (.80 kms) upstream of the Rock Weir." The distance from the Rock Weir to the Dam is 4850' or approximately 9/10 of a mile.

"At higher flood flows the weir control is 'drowned out' and the weir does not exercise any control of upstream water levels. Calculations and field experience indicated that the Rock Weir is effective in passing some flow along the abandoned loop of the stream, and therefore the Weir is effective for the purposes intended, namely to lessen stagnant flows along the abandoned loop of the Valley River."*

In July 1977, R.W. Harrison P. Eng. calculated the backwater effect of the Department of Highways' Rock Weir and he also reached the conclusion that the backwater effect from the rock weir is insignificant and would not extend upstream beyond P.T.H. #5 bridge.**

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* S. Sapinski - P. Eng. 76/08/23. Inter-Departmental memo to G.A. Depauw re: Backwater calculations for Valley River upstream of Manitoba Highways Department Rock Weir structure P.R. #366 Diversion 1962.

** R.W. Harrison - P. Eng. 77/08/08. Inter-Departmental memo to L.J. Whitney P. Eng. re: Backwater Effect of the Highways' Diversion Weir, NE¼ Section 24-25-24W.

In 1981 the P.F.R.A. did a survey of the Valley River channel from the Rock Weir at P.R. #366 to the P.T.H. #5 bridge. In March 1982 Water Resources Branch compared the water profiles obtained from using the original 1962 survey data with those obtained using the 1981 P.F.R.A. data to evaluate the impact of the changes which occurred to the channel since the original survey. Water surface profiles with and without the diversion weir were determined as well as calculations of increases in water levels at the P.T.H. #5 bridge, the latter being shown in Table 3 below:

Table 3*

Freq.	Discharge (cfs)	Water Level Increase at P.T.H. #5 Bridge (Feet)	
		Without Diversion Control Weir	With Diversion Control Weir (Crest Elev. @ 1395.0')
2%	4300	0.20	0.16
10%	2600	0.29	0.22
40%	1000	0.50	0.31

The conclusions reached following this review were, "...that the largest increase in water surface elevation attributable to recent changes in channel cross section would occur at P.T.H. #5 bridge for the three flows considered", and that, "Assuming that the river channel data upstream from P.T.H. #5 bridge remained unchanged, the effect of the changes to the channel cross - section downstream of the bridge would be negligible well downstream of Mr. Doering's property."* (NE 14-25-24W).

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*March 1982 - Inter-Departmental memo, N. Mudry P. Eng. to T.E. Weber Director, Water Resources Branch, Manitoba Department of Natural Resources.

In 1983, following the spring flood of the Valley River, Water Resources Branch again undertook studies to ascertain the backwater effect, if any, of the Highways' rock weir on levels upstream of NE 24-25-24W. The conclusions of this study were that the rock weir had no backwater effect on the natural river stage at NE 14-25-24W.

In September 1983,the Manitoba Water Commission requested Brian W. Korbaylo, P. Eng. with the Manitoba Hydro to review all previous studies on flooding along the Valley River upstream from the Town of Grandview and provide an independent assessment of the effects, if any, of the man made obstructions in the Valley River near Grandview. Mr. Korbaylo's complete report is attached hereto and marked Appendix "B".

A summary of the conclusions reached by Brian Korbaylo are that:

The backwater effect of the Department of Highways' Rock Weir has little or no effect on the natural river stage at the NE 14-25-24W;

That the now removed Town of Grandview Dam had little backwater effect on NE¼ 14-25-24W, and since the crest of this dam was much higher than the remnants of the C.N.R. Crossing, the Burrows stoplog dam, and the temporary Centennial Ford Crossing, these structures would therefore create little or no backwater effect on the NE¼ 14-25-24W;

That the lands bordering the Valley River in the vicinity of the NE¼ 14-25-24W are, on the average, subject to flooding at least once every two years.

VI. DISCUSSION

It has been noted that numerous studies have been done and backwater calculations made using data from 1962 & 1981 P.F.R.A. surveys of the Valley River. It is also acknowledged that recorded water level data on the Valley River between the Highways' rock weir and section 14-25-24W is minimal, and mathematical models which were used to reproduce water surface profiles have not been calibrated. "Nevertheless the results were sufficient to demonstrate that based on the 1962 survey data, the backwater effects from the structures were insignificant at Mr. Doering's property during periods of flood."*

It has also been pointed out by Engineers representing one of the landowners in the vicinity of the Town of Grandview that all previous studies ignored the possibility of sedimentation in the river upstream of the structures, which would reduce the capacity of the river channel, and increase the frequency of flooding. They also suggested that the Town of Grandview water supply dam probably caused sedimentation to increase in the Valley River upstream.

A review of the 1962 & 1981 Valley River surveys undertaken by P.F.R.A. together with an examination of a topographic plan of the Grandview Dam site on the Valley River dated October 1954 does not indicate an

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*Memo - B.M. Bodnaruk P. Eng. to G.G. Duncan P. Eng. 1983-12-12

Note: Doering's property: - NE 14-25-24W

increase in sediment deposition upstream or degradation of the riverbed downstream of the dam. The P.F.R.A survey of 1962 shows the elevation of the riverbed upstream of the dam site to be at approximately 1394' (424.9 m) a.s.l. slightly lower than that shown on the 1954 topographic plan. Also riverbed contours show the elevation of the riverbed to be the same upstream as downstream. If significant sedimentation has occurred a distinct variation in elevation from upstream to down tream should be evident. A comparison of P.F.R.A.'s 1962 and 1981 riverbed profiles do not show any significant change. All of these observations combine to suggest that there has been no significant alteration of the riverbed between 1954 to 1962 nor between 1954 to 1981 due to siltation.

It would appear therefore, that the calculations of water surface levels and backwater effects made by Water Resources Branch are fairly representative of actual conditions. No surveys exist to allow positive conclusions to be drawn, however all available information suggests that there is no evidence that significant siltation has occurred in the Valley River channel as a result of the Grandview Dam.

It would appear that the backwater effect due to the Highways' weir, and remnants of other in-channel man-made obstructions is negligible well before reaching the NE 14-25-24W, and therefore their removal will not reduce flooding of farm lands southwest of Grandview along the Valley River. As noted by B.M. Bodnaruk P. Eng. in his memo to G.G. Duncan 1983-12-12, much of this land "...lies within the flood plain and would be prone to flooding regardless of whether sediment deposition occurred."

Other factors which landowners in the area must consider are the changes in land use over the years, the increased land clearing and improved drainage, all of which alter snowmelt and peak flows during spring runoffs, and consequently alter the pattern of flooding.

VII. CONCLUSIONS

The problem of flooding in the reaches of the Valley River upstream from the Town on Grandview has received a great deal of administrative, political and judicial attention over the last few years. The major contention has been that various structures placed across the Valley River by different agencies has led to an increase in flooding. Some local residents believe that this flooding is due to constrictions in the flow created by structures still in use, such as the Highways' Rock Weir at P.R. #366, the new bridge across Highway #5, and the railway bridge; or the remnants of structures no longer in use such as the old C.N.R. Crossing, the Burrows Stoplog Dam, the Centennial Ford Crossing, and the remnants of the Town of Grandview Water Supply Dam.

After extensive study of existing documentation, interviews with the local people and government officials, and reports from independent experts, the Commission has reached the following conclusions:

1. The region of concern is a relatively wide shallow flood plain that has been designed by nature to carry excess water during times of increased runoff. This makes it an unreliable region for some agricultural activities, although in two consecutive years, 1983 and 1984, the Commission observed good crops on the flood plain region in question. Most agricultural activities require removal of natural vegetation and exposure of the soil to increased erosion. This is evidenced by the 23.4 percent increase in cultivated areas in the Valley River drainage basin between 1948 and 1980; a 16.5 percent decrease in woodlands;

a 2.5 percent decrease in wetlands and a 4.3 percent decrease in grazing lands. In the natural design, wooded land retains snow and rainfall longer and thus retards runoff, while wetlands act as water storage reservoirs. The changes that have occurred have resulted in different hydrologic conditions that are particularly detrimental to flood plain regions.

It is recognized that an increase in the extensive network of drainage ditches in the Valley River drainage basin west of Grandview, coupled with the previously mentioned changes, has contributed to a more rapid runoff both of spring meltwater and individual precipitation events. However, this is a problem affecting the whole of the Dauphin Lake Drainage Basin and is dealt with in the 1984 Dauphin Lake Regulation and Siltation Study by the Manitoba Water Commission.

2. Farmers who have land in the flood plain of the Valley River should be advised of the type of farming activities that are most suited to a region that is subjected to frequent flooding and therefore a shorter growing season. Activity that would create bare soil in the flood plain, especially in the spring, must be discouraged. The land in the vicinity of the NE¼ 14-25-24 W1 is in a flood plain and the historic records indicate that floods in this area occur on a frequency of one in two years. A specific portion, approximately 40 acres (16.19 hectares), is most affected and yet on the

the two visits to the area by the Commission cereal crops were being grown thereon. The crop observed on the second visit (in 1984) appeared to be of good quality and therefore the farmer was fortunate in that year. However, it is unreasonable to expect this type of result consistently in a flood plain in view of the history of flooding in this area, and that the risk involved in growing crops on this land are those of the individual landowner.

3. The Burrows Stoplog Dam, the Old C.N.R. Crossing, the Centennial Crossing, the Old Highway Bridge, and the Town of Grandview Water Supply Dam are no longer in use and, for the most part, have been removed and are therefore no longer causing any significant restriction to flow. However, the Commission does recommend that the barbed wire and debris at the Centennial Ford Crossing be removed only because it is unsightly. Trash and debris collected by the Burrows Stoplog Dam should also be removed and unless the dam has historic value in conjunction with the old sawmill and the town park, consideration should be given to its removal so that it does not continue to trap debris.

4. The Department of Highways' Weir which was built to ensure riparian flow through a loop of the Valley River which was cut off by construction of a bridge over P.R. #366, is not causing flooding to the NE¼ 14-25-24 W1 due to a backwater effect. This Weir is essential now and in the foreseeable future and should remain in place.

5. Although no reference is made to the former water supply dam of the Town of Grandview in the Terms of Reference, the possibility of sedimentation having occurred in the Valley River as a result of the dam was raised by G.G. Duncan Associates, Engineers for one of the local farmers. From information available, and as discussed under Section VI page 17 of this report, the Commission is of the opinion that any sedimentation that may have occurred as a result of this dam has an insignificant effect on any causes of flooding to the NE¼ 14-25-24 W1.

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Pokrant, H.M. Gaboury, Remote Sensing to Assess Land Use/Land Cover Changes Affecting The Dauphin Lake Fishery, December , 1983.

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Weekly newspaper Grandview Exponent, May, 1972.

APPENDIX A

Valley River

Proposed Terms of Reference

of the

Manitoba Water Commission

Agricultural land along the Valley River upstream from the P.T.H. No. 5 crossing has been periodically flooded over the past several years. Most damage occurs to this cropland when the duration of flooding adversely affects crop production. Landowners in the area have repeatedly contended that the existence of obstructions in the river channel between the P.T.H. No. 5 bridge and the P.R. No. 366 bridge has resulted in delayed flow through this section of the river resulting in the prolonged flooding of upstream farmland. These obstructions have been identified by the affected landowners as being: the remains of the old C.N.R. Crossing, the remains of the old Burrows Stoplog Dam, a temporary crossing constructed by the Town of Grandview, and the Department of Highways and Transportation diversion weir.

Previous investigations by the Water Resources Branch have indicated that these identified obstructions have an insignificant effect on water levels upstream from the P.T.H. No. 5 Bridge. Although these investigations have revealed that there is no economic justification for removal of these obstructions, several local farmers are reluctant to accept these results and continue to press for their removal. Since these affected landowners continue to relate economic difficulties associated with flooding along the Valley River upstream of P.T.H. No. 5 to the so-called obstructions they have identified, the Manitoba Water Commission is hereby directed to:

1. Determine the effects of the previously mentioned obstructions.
2. Examine the compatibility of existing land use in the immediate vicinity of the N.E. Section 14-25-24W with historic and expected flood threats.

3. Determine whether or not the previously mentioned obstructions are necessary to satisfy existing and anticipated needs in the vicinity.

4. Submit a final report to the Minister as soon as it is practicable to do so.

July 14, 1983

Al Mackling

APPENDIX B

MANITOBA HYDRO
SYSTEM PLANNING DIVISION
HYDRO DEVELOPMENT DEPARTMENT

FLOODING OF THE VALLEY RIVER IN THE VICINITY OF THE TOWN OF GRANDVIEW AT NE¼ SEC 14-25-24W

January, 1984
Winnipeg, Manitoba

Prepared by:
B.W. Korbaylo, P. Eng.

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1. Introduction

Flooding along the Valley River upstream of the Town of Grandview has been a recurring problem for many years, resulting in lost crop production to the farmland in the immediate area. The landowners in the area believe that flooding of the Valley River has been worsened by manmade obstructions in the river channel between PTH #5 bridge and PR No. 366 bridge on the Valley River. Several hydraulic studies have been carried out by Water Resources Branch, Department of Mines, Resources and Environmental Management, Province of Manitoba, and have concluded that these obstructions have a negligible effect on river stage in the vicinity of NE¼ Sec. 14-25-24W. This report is a general review of the flooding on the Valley River upstream of the Town of Grandview and the effect, if any, of the manmade obstructions in the Valley River at Grandview.

2. Geomorphology of Valley River

The upper reaches of the Valley River extend into the Duck and Riding Mountains, where the slope of the terrain is relatively steep. As one moves downstream to the lower reaches of the Valley River, the terrain becomes much flatter in the vicinity of the Town of Grandview. The river in the vicinity of Grandview may be classified as a meandering channel consisting of pronounced bends whose shape was formed by the streams own process, which involves erosion, deposition and shifting of the channel. Much of the land which borders the Valley River in this area may be considered as a flood plain which is subject to periodic flooding by the Valley River.

3. Hydrology

Floods on the Valley River are generally the result of snowmelt from the Duck and Riding Mountains which occurs during the months of April and May as well as ice jams on the lower, flatter reach of the Valley River. However, large river flows have occurred in the past on the Valley River as a result of rainfall in the later summer months.

Flow data on the Valley River near the Town of Grandview has been recorded since 1956 by Water Survey of Canada at Station No. 05LJ021. The mean flood, defined as the average of the maximum daily flows for the period of record 1956 to 1981 is 1073 cfs and was determined from maximum daily discharge records for the Valley River near Grandview. A flood frequency analysis using plotting position ($\frac{m}{n+1}$) was also performed, the results of which are tabulated in the following Table 1.

Table 1
Flood Frequency - Valley River Near Grandview

Frequency	Flood Peak Discharge in cfs
1 in 2 years	1050
1 in 5 years	1800
1 in 10 years	2400
1 in 20 years	3000
1 in 50 years	3800
1 in 100 years	4600

4. Previous Hydraulic Studies

Since the early seventies, several hydraulic studies have been carried out by Water Resources Branch on the flood effect of manmade obstructions in the Valley River at Grandview. These obstructions have been identified as: The Grandview water supply dam (removed in recent years), the remnants of the old C.N.R. crossing, the remains of the old Burrows Stoplog Dam, a temporary crossing constructed by the Town of Grandview, and the Department of Highways and Transportation Diversion weir, the location of which are shown on Figure 1.

In October, 1973 the Water Resources Branch prepared a report entitled "Effect of the Water Supply Dam at Grandview on Flooding Along the Valley River in Sec. 14-25-24W During 1967" to determine the possible effect of flooding, upstream of the Grandview water supply dam. The report concluded that the dam had an insignificant backwater effect on water levels at Sec. 14-25-24W and that flooding of lands bordering the river channel in Sec. 14-25-24W can be expected to occur at least every two years on the average.

In more recent years (March, 1982), Water Resources conducted further studies on the backwater effect of other manmade obstructions downstream of the presently removed Grandview water supply dam. This study was supplemented by more recent cross-sectional data taken by PFRA in the summer of 1981, as a check to the survey information done in the sixties. These studies again indicated that the backwater effect due to the Highways' rock weir and other manmade obstructions is negligible well downstream of the NE¼ Sec. 14-25-24W.

Following the spring flood of 1983 on the Valley River, Water Resources undertook backwater studies to ascertain the effect, if any, of the Department of Highways' rock weir on levels upstream of NE¼ Sec. 14-25-24W. The calculated water surface profiles for an estimated flood peak of 3075 cfs indicated that the rock weir had no backwater effect on natural river stage at NE¼ Sec. 14-25-24W.

5. Hydraulic Studies

Backwater Calculations

Recorded water level data on the Valley River between Section 14-25-24W and the Department of Highways' rock weir is minimal and it is therefore difficult to assess actual water levels accurately. It was therefore necessary to compute water surface profiles by means of backwater calculations through this reach of the Valley River in order to assess the possible staging effect of the Valley River at NE¼ Sec. 14-25-24W due to Department of Highways' rock weir and diversion channel on the Valley River.

To compute water surface profiles, it is necessary to know the size, shape, slope, and roughness of the river channel as well as a known water surface elevation from which to start. Water surface profiles were began at Gauge 05LJ021 where a natural open water rating curve (refer to Figure 2) has been estimated by Water Survey of Canada from collected field data. The gauge is located approximately 1500 feet downstream of the PR366 bridge on the Valley River.

The size, shape, slope of the river channel is represented by cross-sections of the Valley River which were obtained from Water Resources Branch, and the Department of Highways, and were updated to reflect the 1981 P.F.R.A. survey. The channel roughness coefficients selected were 0.045 for the main river channel and 0.100 for the flood plain.

Water surface profiles were therefore produced for various discharge values and starting elevations from a rating curve at Gauge 05LJ021. Two sets of profiles were computed: one set assuming the Department of Highways' rock weir removed, and the other set assuming the Department of Highways' weir remaining in place. From this data, a rating curve was prepared for the Valley River at the Department of Highways' rock weir as shown in Figure 3 attached, and shows the relative backwater

effect of the rock weir in the Valley River channel. Further upstream in the vicinity of NE¼ Sec. 14-25-24W (section "K"), the backwater effect of the rock weir becomes negligible as shown in Table 2 below.

Table 2

Discharge (cfs)	Water Surface Elevation at Cross-Section K	
	With a Rock Weir	No Rock Weir
750 cfs	1403.95	1403.95
1000 cfs	1404.26	1404.25
2000 cfs	1405.52	1405.51
3000 cfs	1406.69	1406.67
5000 cfs	1408.96	1408.91

1983 Flood

As mentioned earlier, previous studies by Water Resources Branch assessed the backwater effect of the 1983 spring flood for the reported Valley River discharge of 3075 cfs on April 24, 1983. Backwater calculations were made assuming this discharge and water surface elevation upstream of the rock weir of 1399.8 feet with a rock weir crest invert of 1395 feet. The channel bed roughness was assumed to be 0.045 in the main channel and 0.100 in the overbank. The water surface profile is shown in Figure 4 as profile D and indicates a water surface elevation at Section "K" of 1406.36 feet.

In this study, water surface profiles were calculated for the same discharge of 3075 cfs and the same channel roughness values for starting elevations of 1401, 1402, and 1403 feet at the rock weir location, to test the sensitivity of higher than normal water elevations at the rock weir on upstream water levels at NE¼ Sec. 14-25-24W. As shown in Figure 4 that even with as much as a three foot increase in normal stage for a flow 3075 cfs immediately upstream of the rock weir, water levels at section "K" rose only 0.25 feet from elevation 1406.38 to 1406.63 feet.

6. Conclusions

a) The backwater effect of the Department of Highways' rock weir has little or no effect on the natural river stage at Section "K" in the vicinity of NE¼ Sec. 14-25-24W.

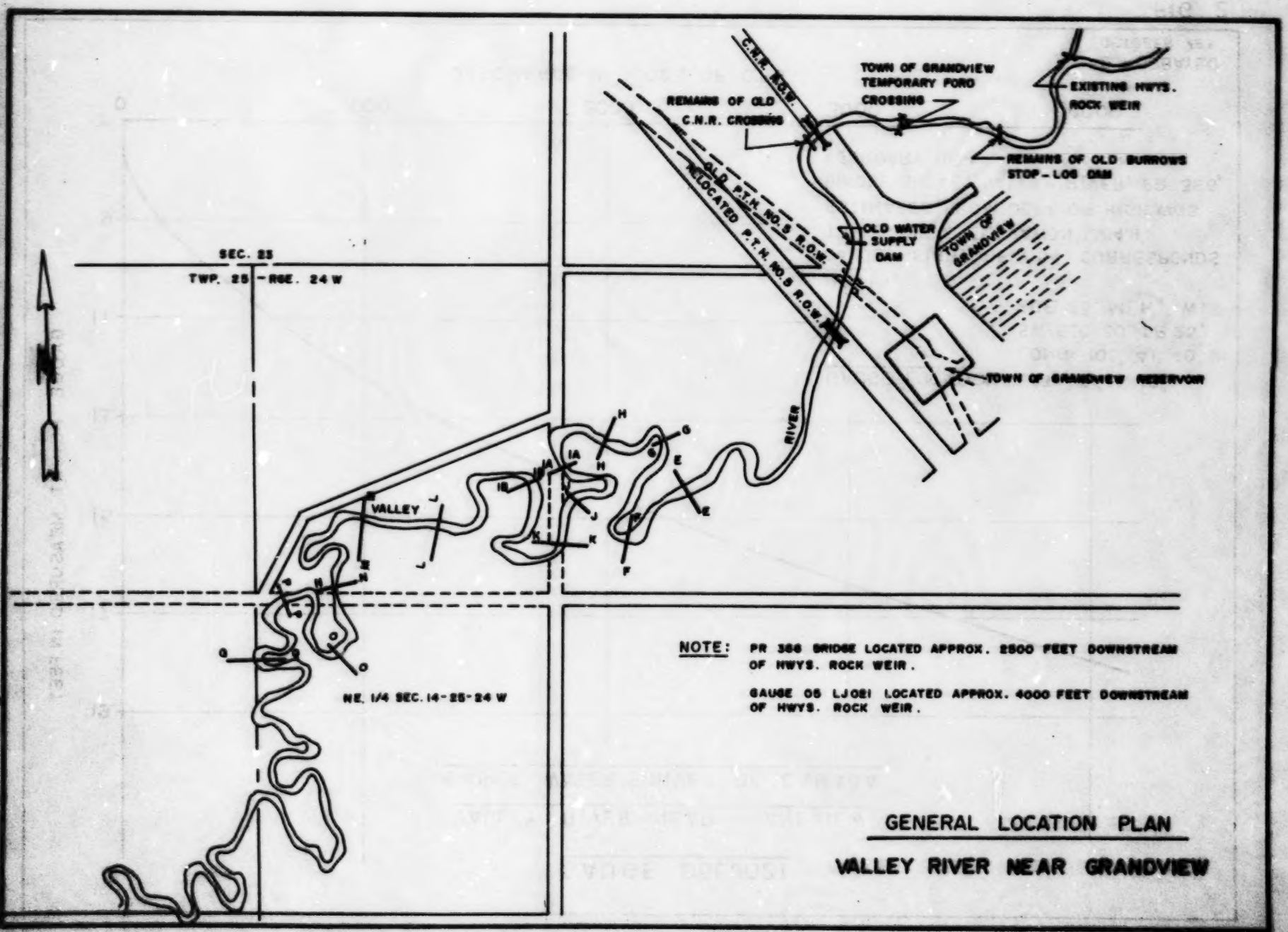
b) The previous study by Water Resources Branch on the backwater effect of the removed Grandview water supply dam (crest invert = 1399.0 feet) concluded that the dam, as well, had little backwater effect at NE¼ Sec. 14-25-24W. Upon review of this study, the writer agrees with this conclusion. Since the crest of this dam was considerably higher than other downstream obstructions other than rock weir, (remnants of the old C.N.R. crossing, remains of the old Burrows Stoplog dam, temporary Ford crossing) it is unlikely that their backwater effect could significantly submerge the Grandview water supply dam and cause a significant backwater effect at Section "K".

It is therefore concluded that these other obstructions have little or no backwater effect on NE¼ Sec. 14-25-24W.

c) With regard to the 1983 Spring Flood, backwater computations indicated that the maximum stage estimated in April, 1983 at NE¼ Sec. 14-25-24W was below elevation 1406.5 for the reported discharge of 3075 cfs. However, it should be pointed out that this discharge value is provisional at this point in time and subject to change by Water Survey of Canada. Nevertheless, this fact would not affect the overall outcome of the conclusion that the rock weir has little or no backwater effect on the natural river stage measured at Section "K" in the vicinity of NE¼ Sec. 14-25-24W.

d) As concluded in earlier reports, the lands bordering the river channel in the vicinity of NE¼ Sec. 14-25-24W are subject to flooding at least once every two years on the average.

BWK/pam
1984 01 04



NOTE: PR 366 BRIDGE LOCATED APPROX. 2500 FEET DOWNSTREAM OF HWYS. ROCK WEIR.

GAUGE 05 LJ081 LOCATED APPROX. 4000 FEET DOWNSTREAM OF HWYS. ROCK WEIR.

GENERAL LOCATION PLAN

VALLEY RIVER NEAR GRANDVIEW

FIG. 1

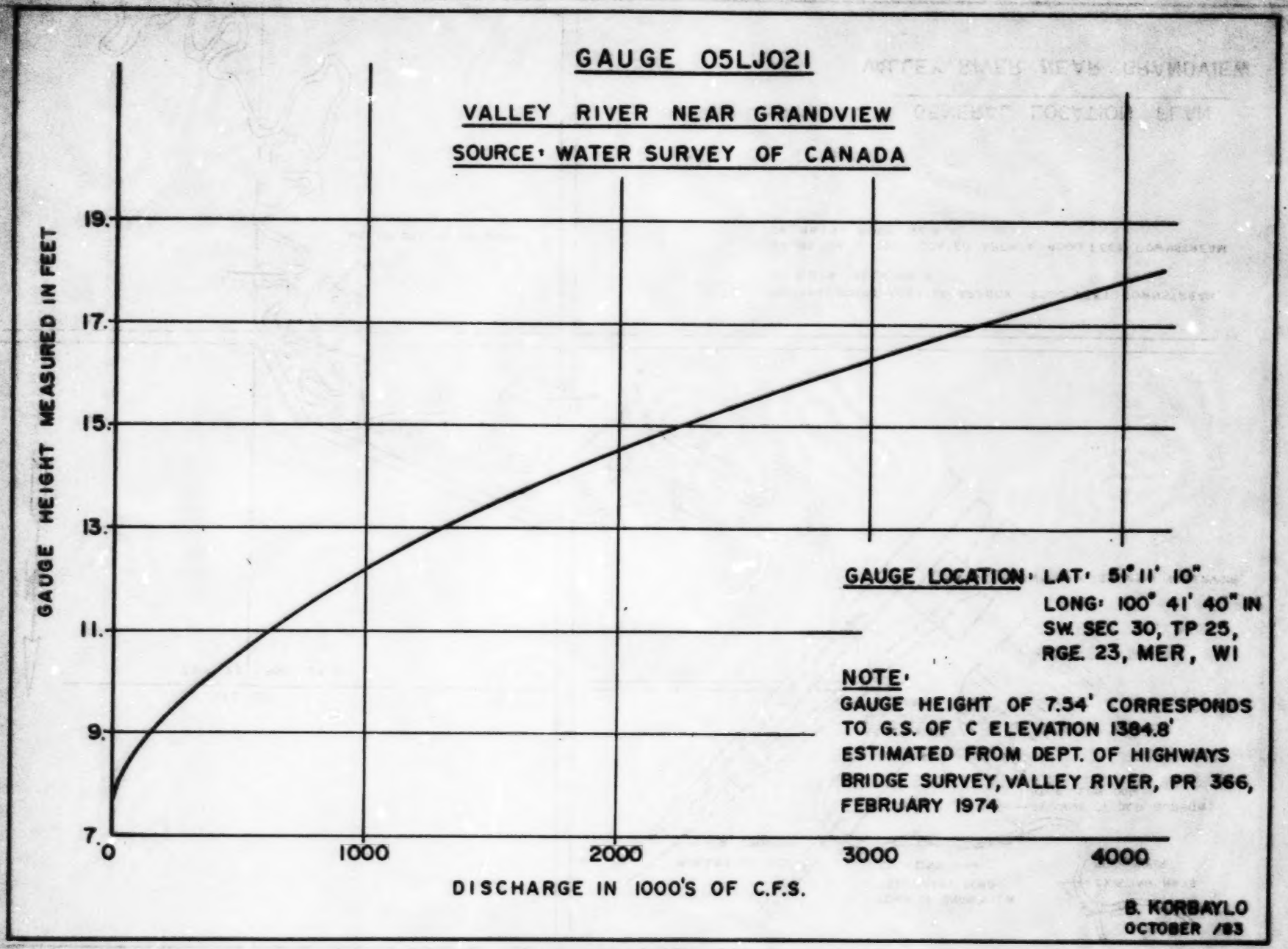
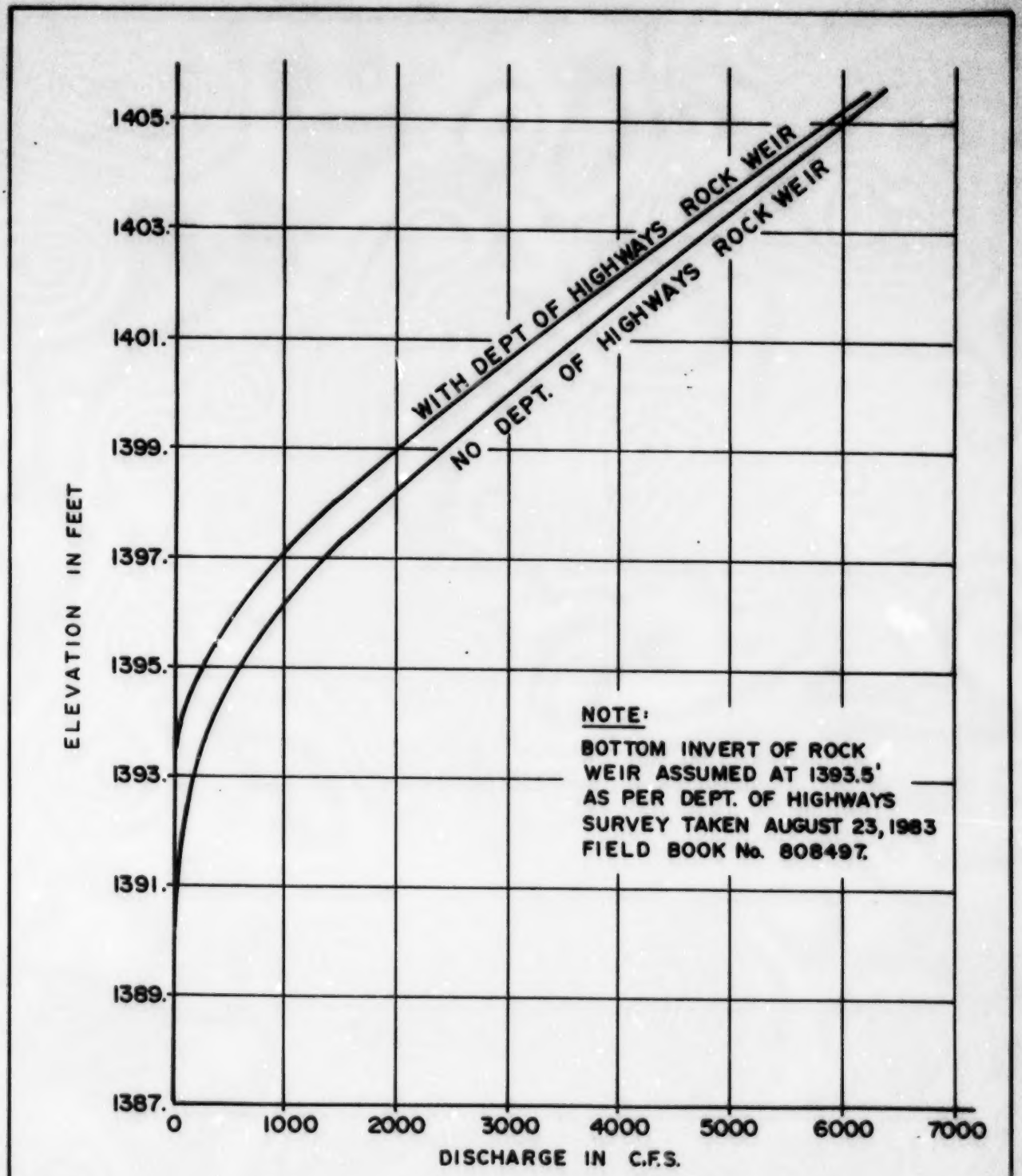

GAUGE 05LJ021
VALLEY RIVER NEAR GRANDVIEW
SOURCE: WATER SURVEY OF CANADA
GAUGE HEIGHT MEASURED IN FEET
19.
17.
15.
13.
11.
9.
7.
0
1000
2000
3000
4000
DISCHARGE IN 1000'S OF C.F.S.
GAUGE LOCATION: LAT: 51° 11' 10"
LONG: 100° 41' 40" IN
SW. SEC 30, TP 25,
RGE. 23, MER, WI
NOTE:
GAUGE HEIGHT OF 7.54' CORRESPONDS
TO G.S. OF C ELEVATION 1384.8'
ESTIMATED FROM DEPT. OF HIGHWAYS
BRIDGE SURVEY, VALLEY RIVER, PR 366,
FEBRUARY 1974
B. KORBAYLO
OCTOBER /83

FIG. 2

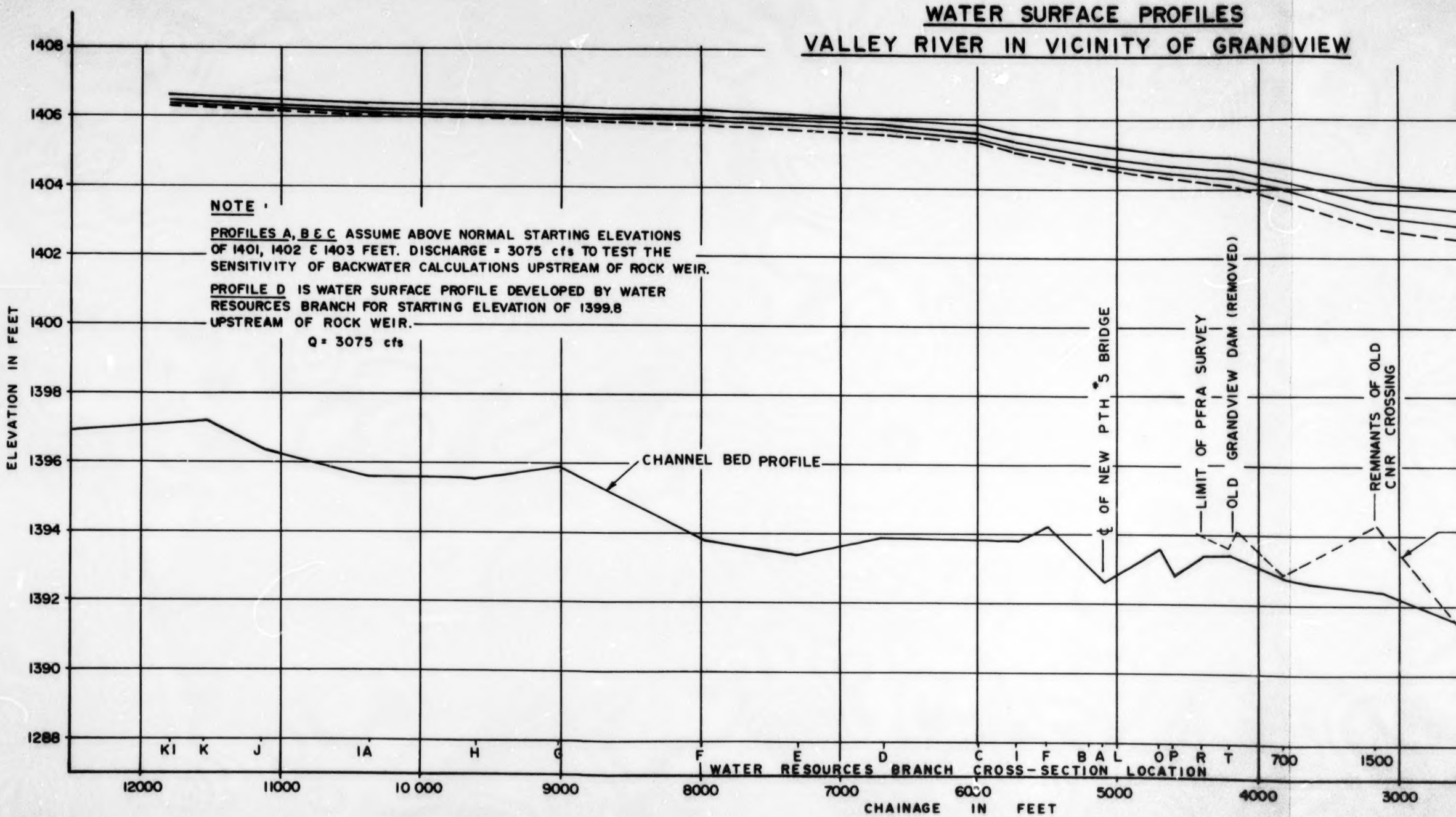


VALLEY RIVER AT
DEPT. OF HIGHWAYS ROCK WEIR
IN THE N.E. 1/4 OF SEC 24-25-24W R.M. OF GRANDVIEW

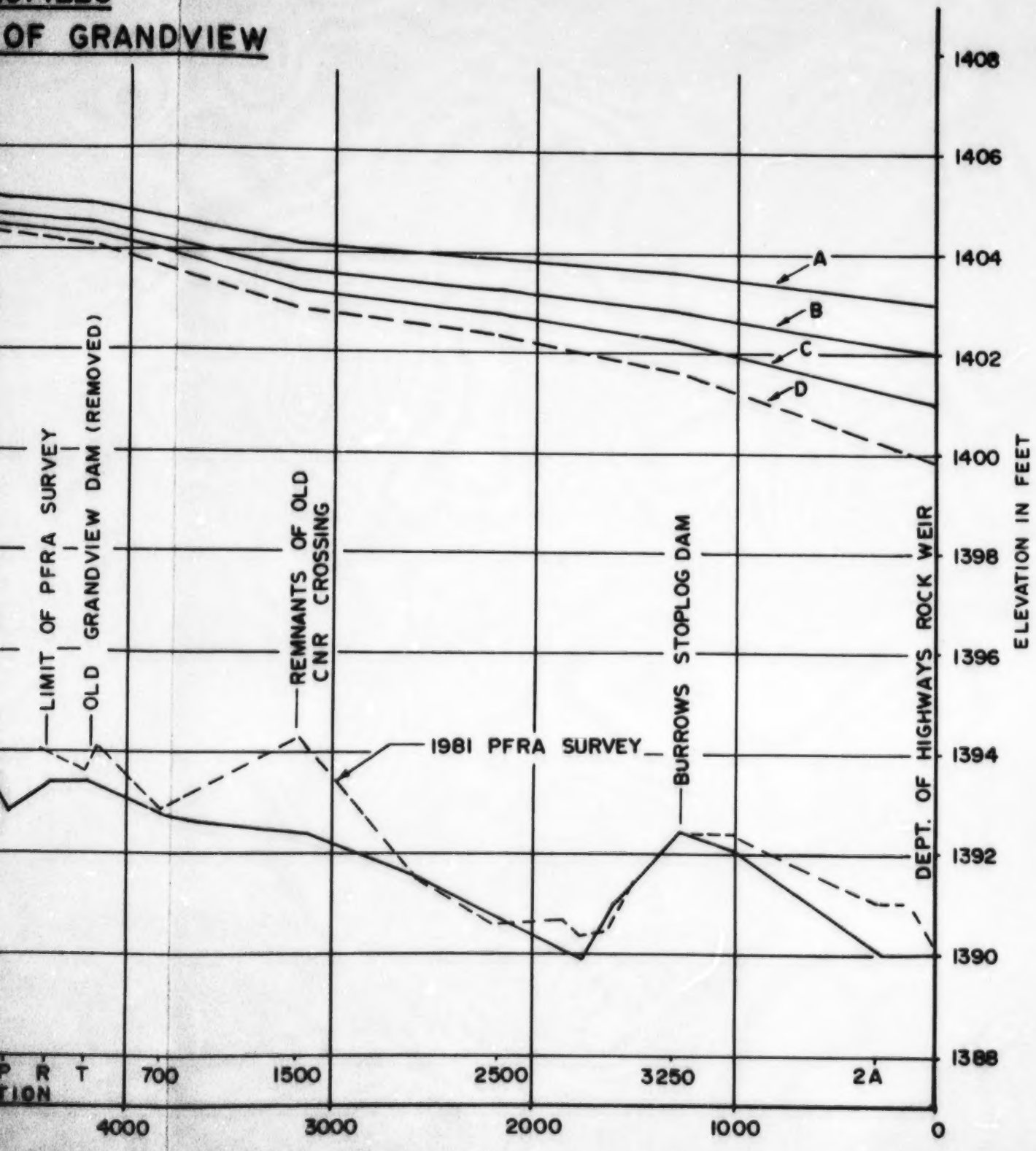
B. KORBAYLO
OCTOBER /83

FIG. 3

WATER SURFACE PROFILES
VALLEY RIVER IN VICINITY OF GRANDVIEW


NOTE :
PROFILES A, B & C ASSUME ABOVE NORMAL STARTING ELEVATIONS OF 1401, 1402 & 1403 FEET. DISCHARGE = 3075 cfs TO TEST THE SENSITIVITY OF BACKWATER CALCULATIONS UPSTREAM OF ROCK WEIR.
PROFILE D IS WATER SURFACE PROFILE DEVELOPED BY WATER RESOURCES BRANCH FOR STARTING ELEVATION OF 1399.8 UPSTREAM OF ROCK WEIR.
Q = 3075 cfs
ELEVATION IN FEET
1408
1406
1404
1402
1400
1398
1396
1394
1392
1390
1288
CHANNEL BED PROFILE
℄ OF NEW PTH #5 BRIDGE
LIMIT OF PFRA SURVEY
OLD GRANDVIEW DAM (REMOVED)
REMNANTS OF OLD CNR CROSSING
K1 K J 1A H G F E D C I F B A L O P R T
WATER RESOURCES BRANCH CROSS-SECTION LOCATION
12000 11000 10 000 9000 8000 7000 6000 5000 4000 3000 700 1500
CHAINAGE IN FEET

ROFILES
OF GRANDVIEW



B. KORBAYLO
OCTOBER /83

FIG. 4